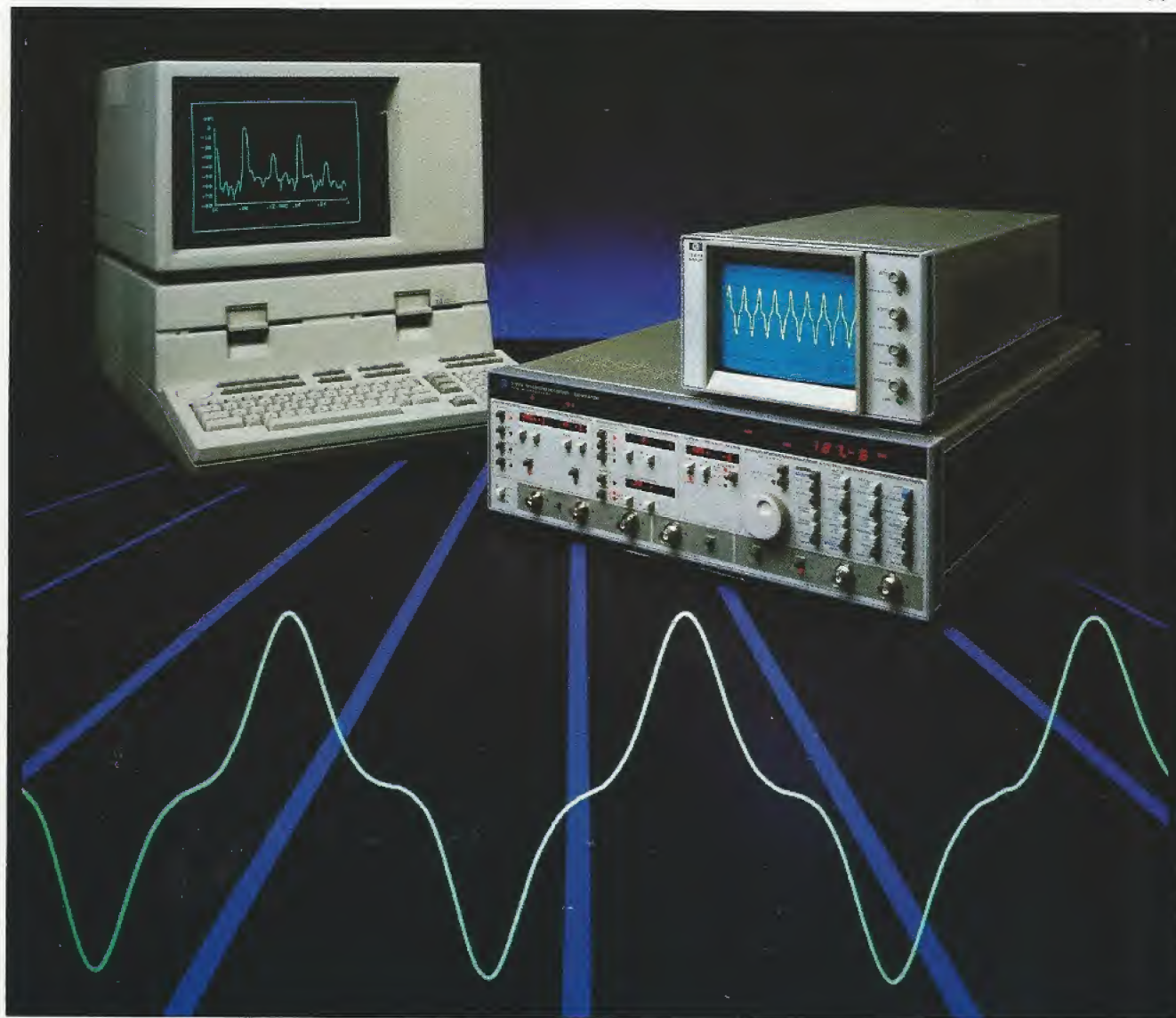


MEASUREMENT COMPUTATION **news**

product advances from Hewlett-Packard

MARCH/APRIL 1984



Capture and replay difficult waveforms with confidence using HP's new waveform recorder/generator

The new HP 5182A Waveform Recorder/Generator combines high-speed waveform capture with arbitrary waveform generation. Now you can easily solve design problems requiring characterization of circuit response to transient or irreproducible events.

Capture/replay

The HP 5182A accurately captures input waveforms with its 20-MHz, 10-bit analog-to-digital converter (ADC) and

stores them in high-speed digital memory. Entire waveforms or selected waveform portions can then be generated by the HP 5182A's 20-MHz, 10-bit digital-to-analog converter (DAC), replicating the signal as it was originally captured. Waveforms may be regenerated one at a time in single-shot mode or repetitively to form a continuous waveform. This combination of capture and replay gives design engineers new tools for working with infrequent or irreproducible waveforms.

(continued on page 2)

Oscilloscope measurement system brochure stresses measurement solutions and productivity

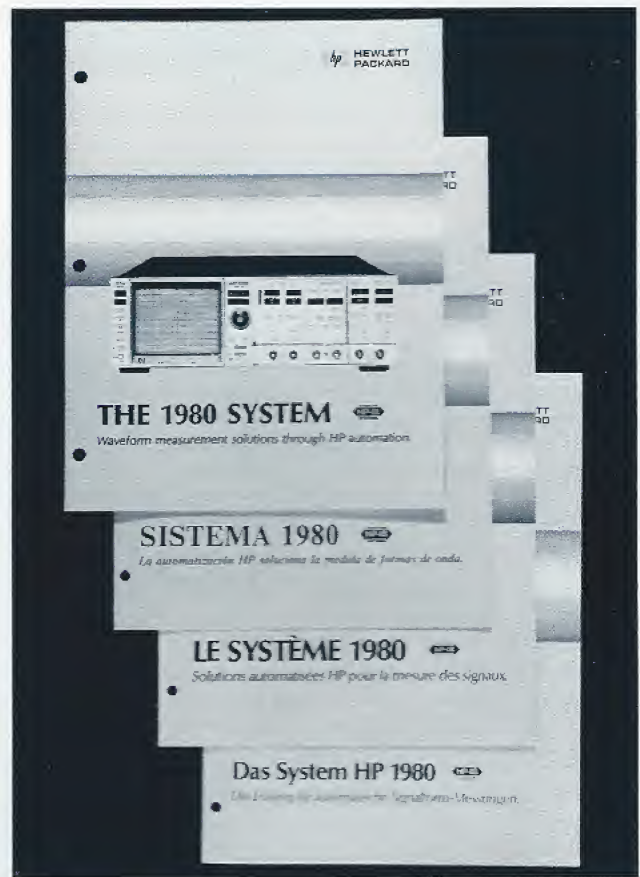
Hewlett-Packard has recently published a new full-color brochure describing the HP 1980 Oscilloscope Measurement System and its role in automatic test systems. Titled *Waveform Measurement Solutions through HP Automation*, this publication discusses how you can improve measurement quality and throughput in production areas, calibration labs, product development labs, and incoming inspection stations. It is available in English, French, German, and Spanish.

This brochure provides guidelines for developing an automatic testing strategy. Included are examples of some of the more common measurements you can make with the HP 1980 system, as well as some of the problems the system can solve.

Also discussed is Hewlett-Packard's concept of the Manufacturer's Productivity Network (MPN) and how you can use it to increase overall productivity.

Provided in the brochure are details about the function and performance of the measurement tools that are part of the HP 1980 System. These tools include a fully programmable oscilloscope, a gated universal counter, a digitizer, programmable analog comparators, and application software.

For your free copy of this brochure, check **B** on the HP Reply Card.



HP's new waveform recorder/generator

(continued from page 1)

Capture/modify/replay

By adding a computer, graphics tablet, and appropriate HP-supplied software package, you can modify waveforms stored in the HP 5182A. Waveforms can be modified with user-defined equations, noise, or freehand drawings. This gives you an easy way to capture, modify, and replay existing waveforms.

Arbitrary waveform generator

The HP 5182A can generate waveforms drawn on a graphics tablet or produced from an equation. With a graphics tablet, you can sketch complex waveforms, which are then generated by the HP 5182A. Equations can be used to create waveforms that are too difficult to sketch with the required accuracy.

Triggering capabilities

The HP 5182A's high-performance digital trigger uses high-speed digital comparators to match the digitized waveform data against the encoded trigger values. The digital trigger provides repeatable, reliable, no-drift triggering each time.

User-selectable hysteresis allows you to control the sensitivity of the trigger circuit to eliminate false triggering or noise.

Variable pretrigger and posttrigger recording lets you observe waveforms before and after the trigger event and select which portion of the waveform will be recorded. This feature is important to failure analysis and fault monitoring and enables you to compensate for known delays between the trigger and the critical part of the waveform. Delays as great as one million sample intervals may be selected.

Other key features

Several other key features make the HP 5182A an important tool in waveform recording and generation:

- Built-in battery-backed CMOS memory of 16,384 words, which can be segmented into 32 separate records
- Remotely programmable front-panel controls via the HP-IB (IEEE 488)
- Ability to transfer waveform records to and from a computer via the HP-IB or the high-speed DMA I/O port
- X, Y, and Z outputs to drive external displays
- Adjustable 50-ohm output amplifier offering up to $\pm 5V$ output
- Sync pulse during every playback cycle for synchronizing other equipment
- Cursors for measuring voltages or time intervals and for selecting portions of the waveform to be generated.

The HP 5182A is priced at \$23,000.

For more information, check **A** on the HP reply card.

Enhancements expand analysis power of HP's logic analyzers

New dimensions in state and timing analysis are now possible with the enhanced capabilities of two high-performance logic analyzers in the HP 64000 Logic Development System. The HP 64600S Logic Timing/Hardware Analyzer and the HP 64620S Logic State/Software Analyzer now offer new capabilities for troubleshooting and monitoring microprocessor-based systems. Both analyzers can be used in a closely linked configuration with other HP 64000 tools for software development and emulation, or as sophisticated benchtop logic analyzers.

The analyzers' enhanced capabilities come from new subsystem software, which is included in new units at no extra cost. Current owners can upgrade simply by loading the new operating software. HP customers who maintain a software subscription service will receive the software automatically at no charge. Otherwise, the software updates may be purchased separately.

High-level language capabilities

With the HP 64620S's high-level tracing capability, you can now read measurement displays in high-level programming languages. Pascal and C statements and their associated comment fields may be traced and displayed directly. Other high-level languages, as well as assembly-level languages, can also be accommodated.

A mixed display format shows a high-level statement and comment field, followed by the assembly language code generated by the statement. The display is similar in appearance to an expanded compiler listing.

Symbolic tracing with the HP 64620S is now simpler. A symbol table associates labels and names with absolute addresses, and the same symbols can be used to define and display measurements. As a result, the symbol table created during compilation, assembly, and linking can be accessed directly by the analyzer. Other symbols can be added as needed.

New analyzer/emulator link

A new interface supports a close link between the HP 64620S and emulators in the HP 64000 system. The HP 64304A Emulator Bus Preprocessor integrates the powerful software analyzer and the emulation subsystem. This combination now makes complex state analysis possible earlier in the development cycle, as the code modules are written.

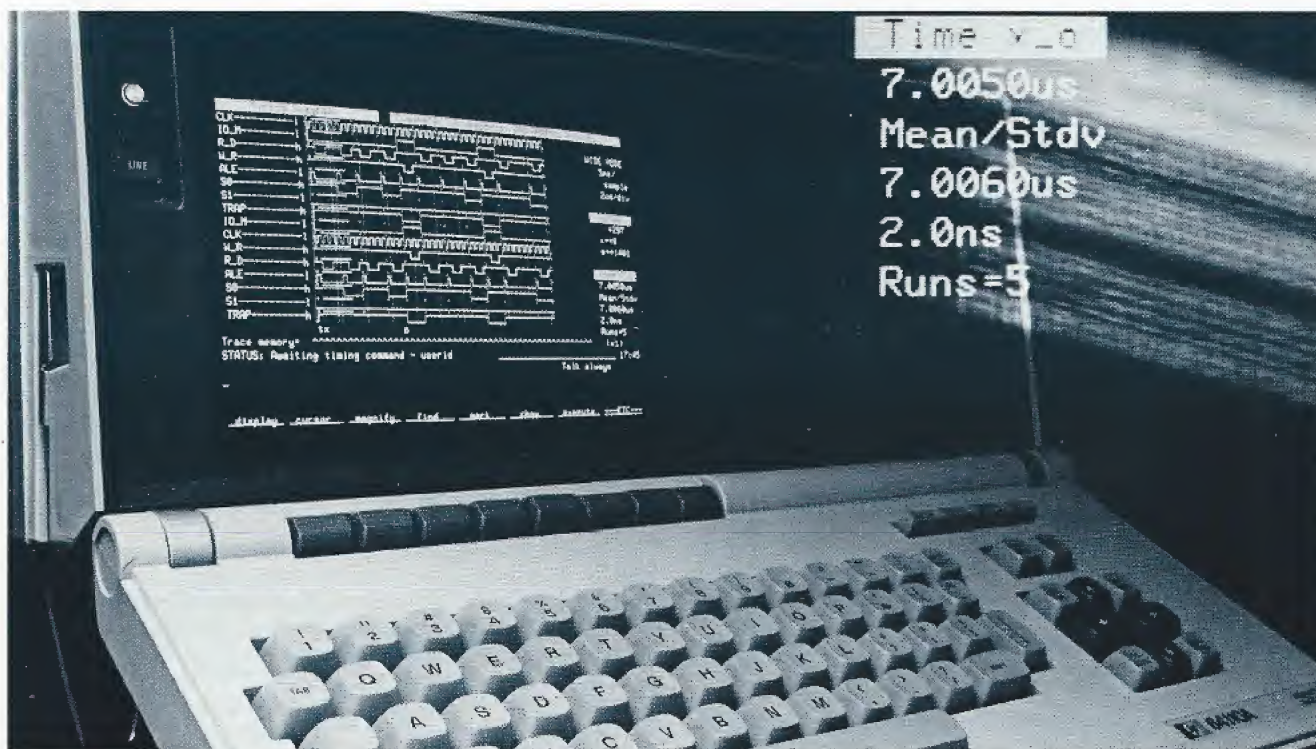
Postprocessing enhances timing analysis

Postprocessing capabilities added to the HP 64600S offer you more freedom and flexibility when manipulating collected timing data. For example, you can set the analyzer to measure time intervals automatically and compute an average reading, providing a more accurate reading for typical system activity.

Measurements can be stored and recalled for comparison and marked for further analysis. A timing measurement can be translated into a state listing, or a timing signal can be used as a clock signal to display the data as a state listing.

The price for separate purchase is \$125 for each software package.

For more information, check **C** on the HP Reply Card.



Enhancements to the HP 64600S logic analyzer add new postprocessing functions that let you perform detailed analysis and automated statistical computations of collected timing data in microprocessor-based systems.

Versatile midrange, half-inch tape drive is ideal as system tape drive

Looking for a half-inch tape drive for backup applications, archival storage, data interchange, or tape processing? The new HP 7974A Magnetic Tape Drive Subsystem can handle all these applications and more. Designed for midrange system backup (100M to 500M bytes of on-line storage), the HP 7974A is a dual-density tape drive with both start-stop and streaming mode operation. This half-inch tape drive offers faster performance at a lower cost than the existing HP 7970E Tape Drive.

Dual-density, start-stop, and streaming

The standard HP 7974A is formatted with 1600 cpi, phase-encoded. An 800-cpi NRZI option is also available. In streaming mode, the tape drive operates at 100 ips (inches per second). Using tension-arm buffering, the HP 7974A also operates as a true start-stop drive at a tape speed of 50 ips. This feature is useful for transaction or data logging. Equipped with an HP-IB (IEEE 488) interface, the HP 7974A is currently supported on the HP 3000 Series 39, 40/42, 44/48, and 64/68. Support on the HP 1000 A Series is planned for later this year.

System software improves streaming backup

Using the new HP 7974A, backup is faster than with the existing HP 7970E, thanks to a newly developed software feature called *Immediate Response*. No longer does the host have to wait for verification that data is written to the tape before sending the next command and data block. As soon

A dual-density option, reliability, and low maintenance costs are just a few features of the new, lower-cost HP 7974A Magnetic Tape Drive Subsystem.



as data is in the tape drive buffer, the drive immediately signals the host to send the next command. Additional software changes have been made to the driver in the HP 3000, enabling the tape drive to stack multiple commands and data blocks for improved streaming performance.

Reliability, maintenance benefits

The HP 7974A is designed for high reliability. Internal diagnostics let you verify that the drive is operational, spot potential problems, and trace the nature of the problems. This results in a reduced mean time to repair if there is a failure. Because of these features, monthly maintenance costs on the HP 7974A are reduced by 40% compared with the HP 7970E, further reducing your cost of ownership.

The HP 7974A Magnetic Tape Drive Subsystem is priced at \$12,500. The optional 800 NRZI format may be added for \$2,500. (In comparison, the 1600-cpi HP 7970E mounted in an upright cabinet is \$16,290; dual density is not available.) For more information, check D on the HP Reply Card.

Industrial terminals offer rugged design and bar-code option for factory applications

Hewlett-Packard's HP 3092A Display Terminal and HP 3093A Graphics Terminal were designed especially for harsh industrial environments unsuitable for normal office terminals.



The HP 3092A and 3093A Industrial Display Terminals can actually be cleaned this way. They meet IEC Standard 529, Level 55.

Each is software compatible with an HP 26XX Series Terminal: the HP 3092A with the HP 2622A Display Terminal, and the HP 3093A with the HP 2623A Graphics Terminal.

Sealed steel enclosures house the terminal electronics and detached keyboard, making both terminals dirt-proof, dust-proof, and splash-proof. They are also grease and oil resistant, require no maintenance, and can even be hosed down for cleaning. Common liquid soaps and detergents may be used to clean the outer surface. The flat-membrane-type keyboard provides audible feedback and comes in one of two layouts: alphabetically sequential for process control applications or entry of a limited amount of data and a typewriter-style layout available in several languages.

Optional bar-code readers are available for both terminals, including two industrial wands and a slot reader for badges or edge-coded documents. Because the decoding process takes place internally in the bar-code reader, its operation is transparent to the computer, which then handles the data as if it had been entered on the keyboard. An RS-232-C datacom interface is standard with each terminal, but for applications in which noise and distance constraints are important, an optional RS-422 Data Communications Interface is available.

The HP 3092A Display Terminal is priced at \$4,305, and the HP 3093A Graphics Terminal is \$6,040. The Bar-Code Reader Option costs \$815.

For more information, check E on the HP Reply Card.

Dictionary software for the HP 3000 Computer is significantly improved and integrated

Are you still laboriously entering endless definitions for your COBOL and Pascal programs? Type no longer because now you can generate them quickly and easily with Dictionary/3000. Dictionary/3000 has been significantly improved and integrated with other HP software products. Dictionary/3000 is currently used for documentation and control of a data base environment, and as the source of definition and location information for the RAPID/3000 software products. New features and utilities allow you to:

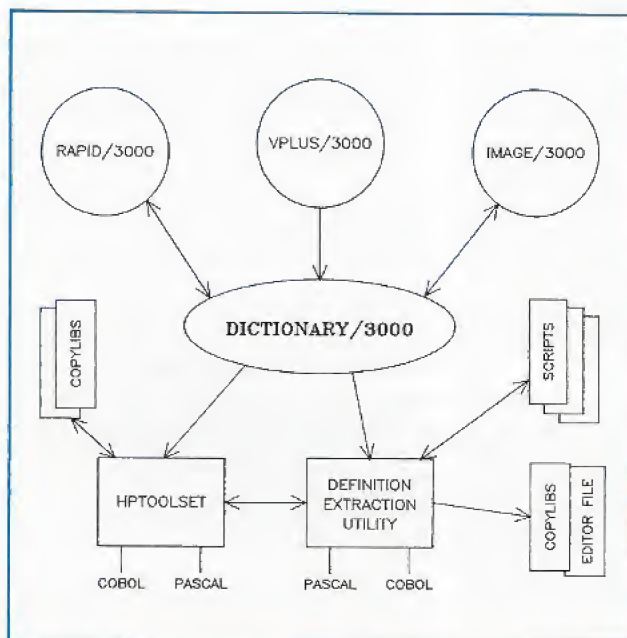
- Generate definitions for COBOL data and environment divisions
- Generate Pascal type and var declarations
- Load VPLUS/3000 form definitions into the dictionary automatically.

The COBOL extraction utility can generate definitions for any type of file (IMAGE, KSAM, MPE, or VPLUS) or for a single element. The definitions can include standard and special parameters, arrays, and implicit and explicit redefines. The Pascal extraction utility can generate type and var declarations for any type of file or element including array definitions and element back references.

The COBOL and Pascal utilities can be used in two ways. First, they can be run stand-alone in both batch and session modes. The definitions generated with this approach will go into a copylib for COBOL and an editor file for PASCAL. Alternatively, HPToolset has been enhanced to call the utilities from within the HPToolset environment. The definitions generated in this instance are written directly into the file or copylib being edited.

With these utilities, development and maintenance programmers can be much more productive. Less time is spent searching for the right data definitions during design. Generating COBOL and Pascal definitions automatically saves coding and debugging time and simplifies documentation.

Included in the new Dictionary/3000 is a utility to load forms definitions into the dictionary from existing forms files. This utility has a user interface similar to the DICTDBD utility



Dictionary/3000 now includes new utilities and links to other HP 3000 Computer software products.

that loads existing data base definitions into the dictionary. Automatic loading of this information allows existing users to begin productive use of their dictionary quickly.

The structure of the dictionary has changed to allow for these enhancements. This means that existing users of Dictionary/3000 will need to run the DICTINIT program to reinitialize existing dictionaries to the new dictionary structure.

The new version of Dictionary/3000 costs \$5000. For more information, check F on the HP Reply Card.

Mass storage ROM provides flexible and Winchester disc support for HP 9845B/C Computers

A special third-party mass storage ROM (MSROM), developed by Structured Software Systems, Inc. in conjunction with HP, offers an inexpensive solution to mass storage problems for the HP 9845B/C Computer. This MSROM allows the HP 9845B/C to support the HP 9121D/S Flexible Disc Drive (3 1/2-inch), the HP 82901/2M Flexible Disc Drive (5 1/4-inch), and the HP 913XX Winchester Disc Drives (5M, 10M, or 15M bytes). The MSROM can be used either independently or in conjunction with the HP 9845 Mass Storage ROM.

In addition, the exchange of serial data between HP 9845B/C and HP Series 200 Computers is made possible by using the MSROM and the SSS LIF Utilities Software, also developed by Structured Software Systems, Inc.

The Mass Storage ROM is priced at \$600. The SSS LIF Utilities Software is \$500.

For ordering information contact Frank Key, Structured Software Systems, Inc., Box 1072 Irick Road, Mt. Holly, NJ 08060 U.S.A. (609-267-1616).

New range of LED indicators can be tailored to specific applications

Hewlett-Packard has expanded its collection of LED indicators to satisfy a wide range of needs. Depending on your application, you can now select from the following array of LED lamps:

- Low-current CMOS-compatible LED lamps specified at 2 mA dc forward current
- Ultrabright LED lamps to replace incandescents for backlighting or high-ambient conditions
- Right-angle LED lamps for card-edge mounting and status indication
- Integrated-resistor LED lamps to conserve board space and minimize part count.

Specific features of each group

The HLMP-1700 Series of low-current LED lamps can generate light output at 2 mA dc forward current comparable to the intensity of earlier-generation lamps at 10 mA dc. These lamps may be driven by CMOS and TTL circuitry without external drivers. Available in T-1 3/4 (5mm), T-1 (3mm), and subminiature package sizes, they come in either high-efficiency red or yellow.

The ultrabright HLMP-3750 Series lamps provide a light output typically in excess of 100 millicandelas at 20 mA dc. Recent dramatic improvements in the efficiency of LED material make these high-output lamps a viable alternative to incandescents in applications requiring backlighting or in high-ambient light. When operated at maximum ratings, these lamps will yield even higher light output. Available in both T-1 3/4 (5mm) and T-1 (3mm) packages, they come in high-efficiency red, yellow, and high-performance green.

Right-angle lamps such as the HLMP-5000 Series offer a solution to diagnostic designs requiring a side-view indicator in a tightly packed card nest. These lamps come prebent and

preinserted into a black, molded plastic housing, which offers a flat seating plane and excellent background contrast. The housing will accommodate any HP T-1 3/4 (5mm) standard-size, high-dome lamp, which can be ordered in this format as a standard catalog product by using a simple option code. The right-angle housing is also sold separately.

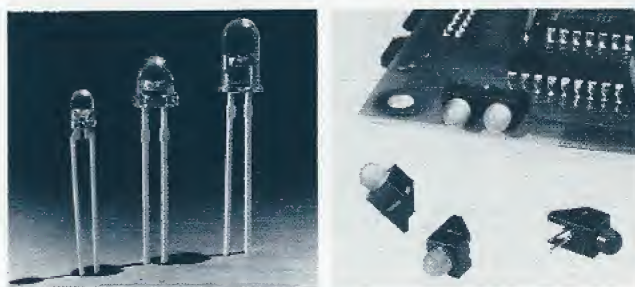
Integrated-resistor LED lamps have become popular in recent years, as equipment manufacturers seek to optimize board space and improve reliability by lowering the number of parts and component insertions per board. The HLMP-1100/1600/3100/3600 Series offers a full range of integrated resistors in both T-1 3/4 (5 mm) and T-1 (3mm) packages. Both 5V and 12V versions are available in red, high-efficiency red, yellow, and high-performance green.

The low-current LED lamps in quantities of 5,000 are priced at 41 cents each for the HLMP-4700/4719 Series, 38 cents each for the HLMP-1700/1719 Series, and 31 cents each for the HLMP-7000/7019 Series. The ultrabright HLMP-3750 Series lamps are priced at 44 cents each in quantities of 5,000.

In quantities of 1,000 the right-angle LED lamps range in price from 29 cents each for the HLMP-5000 Series to 50 cents each for the HLMP-5060/5070/5080 Resistor LED Series.

Integrated-resistor lamps are 34 cents for yellow and green and 31 cents for high-efficiency red in quantities of 5000.

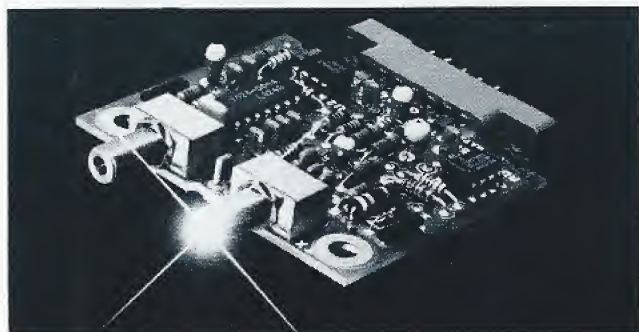
For more information, check **G** on the HP Reply Card.



New ultrabright LED lamps produce five times the light output of previous HP lamps. New right-angle lamps mount easily on printed circuit boards.

Minimize support circuit design with HP's new fiber optic transceivers

Here's a new family of fiber optic transceivers designed to let you evaluate and prototype high-speed links without the cost and inconvenience of support circuit design.



Hewlett-Packard's HFBR-0221 Fiber Optic Transceiver is one of four new high-speed transceivers designed to minimize support circuit design when evaluating and prototyping high-speed links.

The HFBR-0221/2/3/4 High-Speed Fiber Optic Transceivers are printed circuit board assemblies that contain HFBR-1201/02 Transmitters, HFBR-2203/04 Receivers, and support circuitry to provide TTL input and complementary TTL outputs.

The HFBR-0221/22 models are optimized for data formats having 50% duty factors, such as Manchester and biphase, while the HFBR-0223/24 transceivers are designed for arbitrary data formats, including most NRZ schemes. Both designs are, however, compatible with either NRZ or Manchester data formats. Although optimized for 20M-baud operation for use with many LAN schemes, the support circuitry in the HFBR-022X transceivers can be optimized for 40M baud and other data rates. All of these transceivers can be mounted using an edge card connector, either parallel or perpendicular to a reference printed circuit board.

In quantities of 1 to 49 units, the HFBR-0221/2/3/4 High-Speed Fiber Optic Transceivers are priced at \$250 each. These and other HP components are available from authorized HP component distributors worldwide.

For more information, check **H** on the HP Reply Card.

New 2 to 20 GHz amplifier delivers 100 mW output power



100 mW (+20 dBm) output from 2 to 20 GHz makes the HP 8349A Microwave Amplifier attractive for boosting power from broadband microwave sources such as the HP 8350B/83590A Sweeper.

The HP 8349A Microwave Amplifier, an advanced Class A GaAs FET instrumentation amplifier, delivers 100 mW (+20 dBm) of output power with at least 15 dB gain from 2 to 20 GHz. Concentrating this combination of wide frequency coverage and high output power in a convenient half-rack, 7-kg (15-lb) package makes the HP 8349A ideal for a wide range of bench and system applications.

A powerful source accessory

Broadband microwave sources coupled with the HP 8349A's 20-dBm output power are able to meet the high-power demands of mixer driving, long RF cable testing, antenna pattern analysis, and TWT amplifier testing.

Using the HP 8349A and external leveling, the dynamic range of the source's power control features—e.g., calibrated

output power, power sweep, power slope, and remote output power control via the HP-IB (IEEE 488)—is extended up to 100 mW. External leveling is greatly simplified with the amplifier's built-in directional detector. With the output voltage from this detector applied to the external crystal leveling input of the microwave source, typically +20 dBm of output power, leveled to ± 1.25 dB, is available. The amplifier's LED display indicates output power with ± 1.3 -dB calibrated accuracy, often eliminating the need for a separate power monitor.

The HP 8349A is an attractive alternative to narrower-band, limited-life traveling-wave-tube (TWT) amplifiers for increasing the output power from such microwave signal sources as the HP 8350 and HP 8620 Sweep Oscillators, the HP 8340A Synthesized Sweeper, and the HP 8672A and HP 8673 Synthesized Signal Generators.

It's also a preamplifier

Although the HP 8349A is primarily designed as a power amplifier, its low noise figure (typically <13 dB) and more than 18 dB typical small-signal gain make it an excellent preamplifier for such instruments as microwave spectrum analyzers and frequency counters. The sensitivity of such HP spectrum analyzers as the HP 8559A, 8565A, 8566A and 8569B, and microwave counters like the HP 5340A, 5342A and 5343A is improved by 15 to 20 dB when the HP 8349A is used as the preamp. For general preamp applications, two or more HP 8349As can be cascaded.

The HP 8349A can also be used with scalar network analyzers (like the HP 8756A and HP 8755) to extend dynamic range from the normal 60 dB to more than 80 dB.

Price of the HP 8349A Microwave Amplifier is \$7,000. For more information, check I on the HP Reply Card.

New software makes microwave scalar measurements friendlier and more flexible

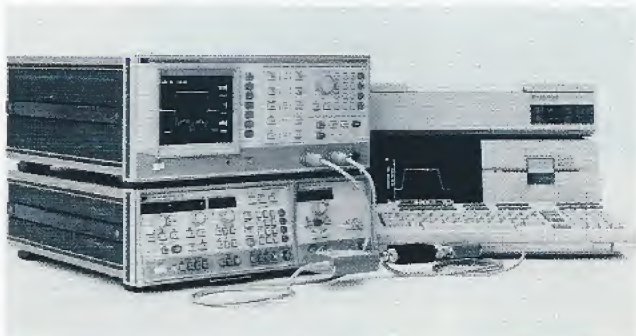
Powerful, easy-to-use software for the HP 8756S Automatic Scalar Network Analyzer lets you make microwave scalar measurements more quickly and easily, and with greater flexibility than was possible in the past.

With the new HP 85015A System Software you can configure virtually any scalar measurement setup and customize the measurement process. Then you can tailor the presentation of results to your needs, using plots, printouts, specification limits, pass/fail notations, and archival data storage. And you can do all this without the need for programming.

The HP 85015A's menu-driven program includes a help capability at every step. With this software you can transform your system's HP Series 200 Computer (Model 216, 226, or 236) into a powerful but friendly measurement controller.

The HP 85015A System Software is \$1,505.

For more information, check J on the HP Reply Card.



New system software links HP Series 200 Computers with the HP 8756S Scalar Network Analyzer to make your measurements more productive.

Advanced test system acquires semiconductor parametric data

Many hours of engineering time can be saved by using Hewlett-Packard's new HP 4062A Semiconductor Parametric Test System during semiconductor design and manufacture to extract dc parameters and measure ac capacitance/conductance. This data can be processed into wafer maps and control charts for stabilizing wafer processes and improving IC yields and quality. A high-level test language simplifies test development and reduces programming time.

New technology

Featured in the HP 4062A is a 48-pin matrix switch in which each device pin is identical. Special hardware design and guarding techniques provide excellent low-level measurement capability. Sensitivities of 1 pA (dc measurement) and 0.001 pF (ac measurement) are specified at each of the 48 DUT (device under test) pins. It is no longer necessary to wire around a matrix switch to achieve high sensitivity. The HP 4062A also provides constant-current sourcing through its matrix pins at currents as low as one picoampere.

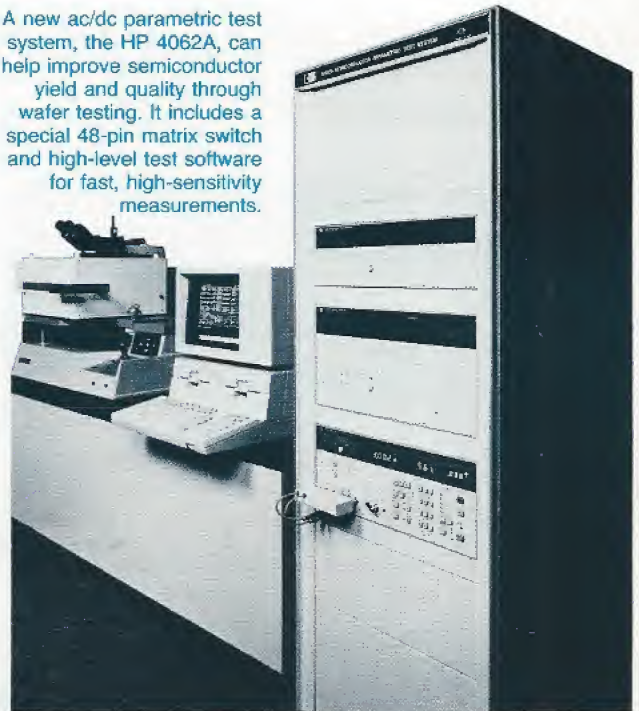
Five state-of-the-art components make up the HP 4062A Semiconductor Parametric Test System. These are (1) a switching subsystem with nine instrument ports and from 12 to 48 DUT pins, (2) a dc measurement subsystem with four source/monitor units (SMUs), two extra voltage sources and monitors, and a measurement-ground unit, (3) a capacitance/conductance measurement subsystem, the HP 4280A 1-MHz C Meter/C-V Plotter, with an internal ± 100 Vdc bias supply that can be swept in staircase fashion, and (4) an HP 9836S Computer, the HP 4062A system controller.

Software features

Complete user programs can be generated by linking application software with data processing and prober software. The software provided with the HP 4062A includes:

- VFP (virtual front panel), which places the front-panel controls and readouts from all HP 4062A instruments on the HP 9836S system controller's display and keyboard

A new ac/dc parametric test system, the HP 4062A, can help improve semiconductor yield and quality through wafer testing. It includes a special 48-pin matrix switch and high-level test software for fast, high-sensitivity measurements.



- TIS (test instruction set), a high-level set of programming commands such as "measure" and "sweep"
- Swept measurements such as I-V, C-V, C-t, G-V, and G-t
- Parameter measurements that include two-point and four-point resistivity, breakdown voltage, dc current gain, threshold voltage, and lateral diffusion effects (ΔL and ΔW)
- Data processing that can produce wafer maps, histograms, scatter plots, control charts, and graphic plots
- Probe pattern generator and optional driver software for popular wafer probers with an HP-IB (IEEE 488) interface.

The HP 4062A Semiconductor Parametric Test System is priced at \$94,540, which includes 48 DUT pins and the HP 9836S controller. The HP 4280A 1-MHz C Meter/C-V Plotter, a subsystem of the HP 4062A, can be purchased separately for \$8,380.

For more information, check K on the HP Reply Card.

hp MEASUREMENT news

product advances from Hewlett-Packard

March/April 1984

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